THE NATURE AND CONSEQUENCES OF PREFRONTAL LOBOTOMY

by

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INTRODUCTION

The life of every man is filled with problems of such complexity that he might well be awed when he realizes that he is able to cope with them at all. Despite the scope of the task, however, most people have achieved in some measure a working agreement with themselves and with their environment. They have reasonably well integrated personalities and are able to see things in a proper perspective, allowing them a comfortable surplus of energy to be used for valuable productive and creative work. This happy state of affairs is, however, not possible for all people.

A human life gone berserk is an awesome thing. The very power which elevates man to a level which can be called human can also turn upon him and create utter chaos in his world. If he were not a sensitive human creature, perhaps he could not become psychotic when he finds himself no longer able to cope with the problems confronting him; the fact remains that it is man's inescapable fate to think and to feel so long as he has intact the basic capacity which enables him to do so. If somehow the methods by which he accomplishes this task become entangled, he may lose contact with the reality around him and even destroy himself.

The story of mental illness is as old as the story of mankind, but yet, great though our achievements have been, we have not been able to solve the riddle of our own behavior. Not enough is known about the development of psychotic symptoms to enable us to fight them effectively. We are still in an experimental stage so far as treatment of mental illness is concerned. A method which helps one person may

harm another, and few good explanations can be offered for this fact. New treatments which show promise are eagerly accepted by doctors as one more thing to try.

The anguish of anxiety is an experience which is new to no one. It is never pleasant, but when it somehow breaks across an invisible line and becomes psychotic suffering, it is terrible to an unbelievable degree. It is primarily those psychoses which involve unbearable tension and worry that prefrontal lobotomy, the surgical interruption of the subcortical connections of the frontal lobe of the brain, was designed to help. A working through of the patient's problem with a new understanding and acceptance of old worries is, of course, an ideal solution, but this requires at least some communication between therapist and patient. When the psychotic defenses are so strong that nothing can break through them, then most means of communication to the patient are lost. Various methods of shock therapy have proved helpful, but some fail to respond. There is a measure of last resort: psychosurgery.

Psychosurgery has been used in this country for about twenty years. At first hailed by many as a miracle, and later damned by others as a design of the devil, it has persisted; and so has the controversy. This paper is the result of an attempt to cull from the literature in the field a few truths concerning psychosurgery and its place in the treatment of mental illness today. Research has been limited to one of the first and more radical methods used, that of prefrontal lobotomy.

The writer started from a complete ignorance of the whole subject

but it soon became evident that the field was too large to be covered effectively in a semester's work. Many, many researchers devote their whole lives to this problem without finally knowing the answers to all the questions that can be asked about it. Medical men are not in complete agreement about its use and effects. Strong arguments have emerged in every direction. Some of them are presented here in an attempt to answer the question: What is the nature and what are the consequences of prefrontal lobotomy?

This paper is organized into two major divisions with subtopics in each. The first of these is called The Nature of the Operation; it deals with the historical development of prefrontal lobotomy, provides background material on the brain and the disorders for which the operation is prescribed, and describes the surgical techniques used in its performance. The second major division, Consequences of the Operation, endeavors to give some idea of the effects of lobotomy upon affective behavior, personality, intelligence, social adjustment, and occupational adjustment of those persons who undergo it. The over-all picture of prefrontal lobotomy which emerges in this study is briefly described in summary remarks.

PART I. THE NATURE OF THE OPERATION

CHAPTER ONE

HISTORY OF THE OPERATION[1]

Lobotomy as we know it today is a relatively new thing, but surgical treatment of mental illness may be quite an ancient technique. Skulls with trephine holes have been found in Peru, indicating that the Indians of that country performed cranial operations for the relief of such things as headaches and convulsions as far back as the history of the country can be traced. The trephine holes may have been made to allow evil spirits to escape, but some observers believe that even surgical rather than magical operations were performed, since there is no evidence that the removed bone was saved for a charm.

Facts concerning the frontal lobes began to accumulate only in comparatively recent times, first as a result of accidents, (as in Boyle's case of the horseman who showed drastic behavior changes as the result of a head injury in 1691) and later from experimental work done with animals. Goltz, a German physiologist, studied the effects of lesions in the cerebral cortex on the behavior of dogs in 1874. He found that lesions made in the anterior half of the cortex led to a slowing up of activity.

Goltz's findings were applied to human beings by a daring young Swiss, Burckhardt, who in 1888 performed operations to cut part of the left cerebral hemisphere in certain patients who were very disturbed by hallucinations; Burckhardt believed that agitation could be relieved by removal of part of the temporoparietal region. His first patient required four operations, but eventually became quiet enough to live in peace in the hospital. One of the four patients thus

treated by Burckhardt recovered so well that she was allowed to leave the hospital; she drowned a month later, so no extensive follow-up could be made in her case. Such an outcry was raised against Burckhardt, however, that he was forced to give up the technique after only four operations; he published his findings in the hope that they would prove valuable in later years.

In 1910 a Russian surgeon named Puusepp severed the connections between the frontal and parietal lobes in patients who were suffering from manic-depressive psychoses. He cut on only one side and the results were negligible.

Considerable work was done on animals in the years which followed, but little was done toward applying the findings to human cases. Fulton and Jacobsen found that chimpanzees normally tended to react with behavior indicating frustration when their performances in test situations were unrewarded, but that following bilateral ablation of the frontal cortex, temper tantrums and anxious behavior tended to be greatly reduced and that even if the animals were made angry they tended to forget their rage very quickly.

To Egas Moniz of Portugal goes credit for the first lobotomy performed in modern times. He was deeply impressed with the findings of Fulton and others; in addition he had a theory that certain psychotic symptoms were caused by synaptic patterns in the brain having become abnormally fixed, so that the patient's behavior was hopelessly stereotyped, and that, if these fixed connections were severed, the brain might have a chance to establish new ones without the

abnormalities then present. After careful study of the animal evidence, he decided, in 1935, to undertake the operation. He persuaded Almeida Lima to perform it on some patients who had failed to respond to any other method of treatment. At first, the physicians only made injections of alcohol, but soon, growing bolder, they made incisions in the frontal lobes. Of the first twenty cases reported, seven were considered cured and seven improved. The best results were obtained with agitated depressive patients; Moniz had little success with schizophrenics.

About this same time, Morel and Ody, in Switzerland, reported the case of a schizophrenic whose psychosis was helped by a similar operation, although at the cost of intellectual impairment. They were pleased with their results, nevertheless, and justified their action by saying that, "it is better for him to have a simplified intellect, capable of elementary acts, than an intellect where reigns the disorder of subtle psychoses. Society can accommodate itself to the most humble laborer, but it justifiably distrusts the mad thinker." The chief result of their work seems to have been improved behavior, with little change in the underlying problems of the patient.

In 1936 Freeman and Watts performed the first prefrontal lobotomy in this country. The patient was a woman 63 years old, who had suffered from agitated depression for some 20 years. At the time of the operation she was quite uncontrollable, climbing over furniture, yelling, laughing, and crying hysterically. It was necessary to hold her down forcibly to administer the anesthetic for the operation.

Four hours after she woke up, she was calm and seemed happy. When asked what had troubled her when she came to the hospital she replied, "I don't know. I seem to have forgotten. It doesn't seem important now."

The pioneers in this field were subjected to a great deal of criticism. While some of it was undoubtedly of the "bleeding-heart" variety, it cannot be denied that it is a serious thing to tamper with the human brain; and to use a technique with such an uncertain outcome was a bold step indeed. On the other hand, if no doctor ever had, many patients living relatively happy lives today would still be suffering. The new technique at first caused quite a stir, because it was one of the very few methods for the treatment of mental illness then known to exist, even for experimental purposes. The development and wide use of the various methods of shock therapy prevented an overly enthusiastic acceptance of lobotomy. This was probably fortunate, for work on lobotomy was thus able to continue more carefully and slowly. The question of the relationship of the frontal lobes to human behavior came to be studied very extensively and lobotomy has made important contributions to these studies.

Although the present paper is concerned particularly with prefrontal lobotomy, it might be indicated that this operation now has several historical descendants. Until 1947, surgeons tried to sever as many of the frontothalamic connections as possible and varied the plane of section only in the anterior-posterior direction. Later progress in studies of the specificity of function of the frontal lobes has led to many attempts to devise a selective operation which

surgeons hope will allow them to limit lesions to specific areas concerned with the specific behavior under consideration. Such an operation might lessen the personality blunting which inevitably follows psychosurgery but at the same time, give relief to the patient.

Some of the operations which have been developed in connection with this research include:

1. Transorbital lobotomy. Introduced by Fiamberti in 1937, this operation involves inserting a transorbital leucotome, which looks a great deal like an icepick, into the conjunctival sac at the top of the eyeball, driving it through the orbital plate of the skull and into the brain to a depth of 7 cm., and moving it about 20 degrees medially and laterally to sever the connections between the frontal lobes and the thalamus. The patient is anesthetized by electro-shock and has no unpleasant after effects from the anesthetic. This "blind puncture method" has the disadvantage of being just that. It lacks precision. The brain may shift its position when it is pressed upon by a blunt instrument, all brains are not alike, and arteries are threatened if the doctor is not extremely careful. On the other hand, the operation is relatively simple to perform and has very few bad after effects. The patient is usually able to be up the next day, with beautiful black eyes to show for his experience. This method is often used before the more radical prefrontal operation is tried. If it fails to bring relief, a prefrontal lobotomy may be performed later.

2. Topectomy. This involves the removal of cortical tissue.

Freeman calls this operation the most effective of the methods of cortical ablation. Areas 9 and 10 of Brodmann are excised by means of ablations made on the surface of the frontal lobes. It is, however, a major operation, requiring full craniotomy procedure and greatly endangering the blood supply; its use is correspondingly limited.

3. Selective cortical undercutting. Various areas of the frontal cortex are severed at the junction of the gray and white matter, which has few blood vessels to be risked. The operation is performed through two-inch trephine openings over areas 9 and 10 of Brodmann, since these are the areas affected in transorbital lobotomy and topectomy, also. These operations have reportedly achieved a fair measure of success. This method is preferred by some doctors because it presents so little danger to the blood supply.

4. Thalamotomy. This method aims at the precise electrical destruction of parts of the thalamus by means of a complex machine developed for the purpose. A wire is inserted into the brain and the selected parts are "burned" so that they die. It has the disadvantage of being a "blind" operation too, but it is at present the most precise method known. It requires quite an elaborate team of well-trained technicians. Although Freeman says one can insert a wire into any desired subcortical area with almost no damage to adjacent parts of the brain, some damage is done to surrounding tissues by the gases which are generated during electrolysis and from ruptured blood vessels.

5. Gyrectomy. This operation involves the removal of tissue

of the frontal cortex along lines of the sulci in order to leave normally functioning gyri behind.

Lack of accuracy is still a major problem confronting users of psychosurgery; so far surgical precision "appears to lag far behind" advances made in other aspects of the field. A lack of clear differentiation of areas of the affected parts of the brain and the individual differences between brains still offer deterrents to progress. Despite many problems still to be worked out concerning its proper use and application, and the unpleasant effects which may accompany it, most doctors feel that psychosurgery has established for itself a definite place in the treatment of mental illness.

The specific techniques involved in the performance of prefrontal lobotomy will be considered in greater detail later. This paper will turn now to a consideration of the background data in neurology and abnormal psychology required for an understanding of the operation and its effects.

CHAPTER TWO

THE BRAIN[2]

Some knowledge of the structure and function of the brain is essential for an understanding of what prefrontal lobotomy actually is and what it does. This section is designed to present a few basic facts about the brain, especially the forebrain, which is the part affected by the operation.

The brain is that part of the central nervous system which is contained within the skull. It has three main parts which emerge as separate and distinct almost immediately after the embryological brain begins to develop. Embryology is quite outside the scope of this work but a little of it here may enhance the understanding of the different parts. After conception the fertilized egg begins to divide and soon develops into an embryo with three germ layers, the endoderm, mesoderm, and ectoderm. Two longitudinal ridges arise from the ectoderm; between these ridges lies the neural groove. The ridges grow together and enclose the groove, which then becomes the neural tube. Even before the tube closes, three enlargements appear at its cephalic or "head" end. These enlargements give rise to the three main parts of the brain, the forebrain, the midbrain, and the hindbrain. From the rostral portion of the prosencephalon, or forebrain, the cerebral hemispheres with their cortex and the lateral ventricles develop; from the caudal part of this same structure the thalami and the third ventricle arise. The two structures of most importance in prefrontal lobotomy, the frontal lobes and the thalamus, thus develop from the same part of the embryological brain. The mesencephalon, or

midbrain, undergoes remarkably few changes in the process of its development. The rhombencephalon, or hindbrain, develops into the pons, the cerebellum, and the medulla oblongata.

Three membranes known as meninges cover the brain. When these are removed, its surface appears moist and pale brownish-gray; it is covered with irregular grooves, called sulci, and convolutions, called gyri. The largest of the sulci, the median longitudinal fissure, separates the two cerebral hemispheres. They are connected to one another by bands of nerve fibres, the largest of which is known as the corpus callosum. Below the cerebral hemispheres lie the thalamus, the midbrain, the pons, and the medulla oblongata, which is continuous with the spinal cord. The cerebellum lies above the pons and medulla oblongata, behind and below the cerebral hemispheres.

The outer of the three meninges, known as the dura mater, is tough, shiny, and inelastic. The meningeal arteries which carry blood to the bones of the cranium lie on its surface. Folds of the dura mater form partitions between the two hemispheres and between the hemispheres and the cerebellum. These folds do not follow the convolutions and sulci but comprise the various sinuses by which blood and cerebrospinal fluid are drained into the veins of the neck. The second of these membranes, the arachnoid mater, is thin and elastic. Between the arachnoid and the dura is the subdural space, which has no outlet; if bleeding occurs in this area there is no way for the blood to escape. The subarachnoid space lies between the second and third membrane. The pia mater, the third and inner membrane, is fine and full of tiny veins. It covers the brain closely,

following its every fold.

Inside the brain are four cavities called the ventricles; two called lateral ventricles in the cerebral hemispheres, a third ventricle between the two thalami, and a fourth ventricle which is in the medulla oblongata. The ventricles communicate with one another and with the subarachnoid space. Inside each one is a choroid plexus, which by some means produces the cerebrospinal fluid. This fluid circulates through the brain and spinal cord, serving them in both a protective and a nutritive capacity.

The midbrain and the hindbrain will not be considered in detail for they are not directly affected in any way when a lobotomy is performed. The various structures of these parts are concerned with integrative and sensory mechanisms, with muscular coordination, and with the vital cardiac, vasomotor and respiratory centers.

The hypothalamus, located below the thalamus, is the "highest vegatative center in the brain" and is concerned with control of emotional behavior and wakefulness, among other things. It seems to be involved in both sympathetic and parasympathetic activity.

The thalami are ovoid in shape, situated one on each side of the third ventricle. They are about 4 cm. long and act as relay stations for sensory impulses on the way to the cortex. In lower animals the correlation of all sensory impulses takes place in the thalami themselves, and there is evidence that even in human beings, when the connections to the cortex have been cut, sensory impressions can still reach consciousness in the thalamus alone. The thalamus is made up

mostly of gray matter with a covering of white matter. Its main divisions are called nuclei. Afferent fibres come to it from the various parts of the brain which relay upward impulses concerned with proprioceptive and discriminative sensibility, visceral sensibility, pain, and temperature. It sends efferents to all parts of the cerebral cortex, especially to the parietal and frontal association areas, and to the caudate nucleus, a part of the corpus striatum. It correlates impulses, but does more, for there is good reason to suppose that the activities of the thalamus enter into and are appreciated by consciousness. For example, visceral impulses go from the thalamus to the cortex, allowing the cortex to exert a control over instinctive reactions which might otherwise arise from them.

The cerebral cortex consists of gray matter which is made of the bodies of nerve cells; below it lies the white matter, consisting of nerve fibres of various sizes. These fibres are classed according to their course and connections into three different types. The commissural fibres connect areas within one hemisphere with corresponding areas in the other, the association fibres connect different cortical areas of the same hemisphere to each other, and the itinerant or projection fibres connect the cortex with the brain-stem and spinal cord. The cerebral cortex receives its afferents from the thalamic nuclei alone, although not all thalamic efferents go to the cortex.

The human cerebral hemispheres are enormously developed in comparison with those of any other animal. Their surface is divided into lobes, for descriptive purposes. The frontal lobe lies in front

of the sulcus known as the fissure of Rolando, the occipital lobe is at the back, posterior to and below the parietal lobe, and the temporal lobe lies below the fissure of Sylvius and anterior to the occipital lobe. Various areas of the cortex have been accurately mapped with respect to function. Roughly, the frontal lobes are concerned with "biological intelligence" and pre-motor activities; they also embrace some so-called "suppressor areas," the stimulation of which results in the inactivation of all the body's muscles. The parietal lobe is connected with somasthetic sensory impulses, the occipital lobe with visual sensations and imagery, the temporal lobe with visual speech, speech understanding, and auditory sensation and imagery.

The frontal lobes were once called the "silent area" of the brain because of the absence of gross and easily categorized changes in behavior following their stimulation or destruction. Studies were made with animals first. After the removal of the frontal lobes in rats, cats, and monkeys, a general increase in motor activity of a random and spontaneous nature was noted. Sometimes hyperactivity and apathy were both present, or apathy alone. This condition usually cleared up in time. The frontal areas are connected to the visual, auditory, and other sensory areas by association fibres, and to the thalamus by itinerant fibres; they seem to analyze different impulses which they receive into those which are to be pleasant and those which are not, thus determining the personal reaction of the individual to these stimuli. Past experience contributes a great

deal to this personal reaction also. When impulses are relayed to the cortex by the thalamus they spread by association fibres over a wide area. The activity in the nerve fibres continues long after the original stimuli have gone, and traces of it may remain as a memory so that the same pattern of response is followed when a new stimulus is given. Memories allow the individual to act in the light of previous experience and to modify his behavior accordingly. After permanent pathways have been established, memory and intelligent cognitive reactions are mediated here. The integration of impulses is the great function of the frontal lobes. They have the unique ability to take a variety of stimuli and make them into a meaningful whole for the individual involved. The "great unitary harmonies" which make up an organized personality are in some way mediated here and knit into that personality. They are the basis of that behavior which is essentially human—man's ability to see relationships and act with foresight in complex situations.

The frontal lobes seem to have another function which is hard to analyze: they govern the attitude of self toward self. There is strong evidence that, following cortical destruction in the frontal areas, there is a loss in this attitude toward the self; and Freeman and Watts consider this the most marked and important change which occurs in the personality of lobotomy patients. They have postulated that the areas of the cortex which are anterior to the fissure of Rolando are concerned mainly with the ability of a normal individual to project himself into the future and to plan ahead. This feature of behavior

seems to be lost after lobotomy.

The frontal lobes are concerned with the highest types of intellectual functioning—imagination, fantasy, and creative activity, and the ability to use these in forming the complex systems of thought and behavior necessary for successful living. They enable man to see himself in relation to whole situations and to react to them with appropriate emotion and with necessary deliberativeness and patience.

Careful studies done by Freeman have indicated that there is almost a "point to point relationship" between areas in the thalamus and those in the cortex. There have even been cases in which the very pattern of the operation showed up in the degeneration of the thalamus. Studies have shown that it might be possible to obtain good results from an operation which spared radiations to the lateral or anterior groups of nuclei. There is little or no degeneration in the cortex, but it is marked in the thalamus following lobotomy. Freeman points to the dorso-medial nucleus as the "anatomic substrate for emotion especially in connection with ideational processes relating to the self." A certain quantitative reduction in the cellular component of this nucleus seems compatible with a useful existence freed from abnormal behavior. He says, "It is our opinion that the localized degeneration of the thalamus has more to do with satisfactory mental results than anything else in the picture."

Other studies have failed to find as much specificity in the areas of the cortex which correspond to those of the thalamus, but there is general agreement that the two are very closely related as to area. There have been several attempts made to attack the thalamic

nuclei directly without damaging the frontal lobes in the hope that an operation of this type would have the desired good affects without the bad ones which now follow lobotomy.

CHAPTER THREE

APPLICATIONS OF THE OPERATION

There is a rather limited number of conditions to which prefrontal lobotomy is applied, although some surgeons tend to use it more than others. Generally, however, it is used only in severe cases of the affective psychoses, schizophrenia, intractable pain, and neuroses.[3]

The affective psychoses seem to be most benefited by lobotomy; they also show the highest rate of spontaneous recovery and respond quite favorably to shock therapy. Since they frequently do respond to less dreastic treatment, lobotomy is seldom necessary in cases of this kind. Disorders of this type may be manifest as manic or depressive reactions. The manic state is characterized by elation and wild overactivity. Such patients tend to have grandiose delusions. Depressive patients, on the other hand, are in deep gloom, tend to have delusions of self-condemnation, and show behavior varying from violent agitation to stupor. Either one of these states, or more rarely, an alternation of the two, may be present in a single individual.

Involutional melancholia is a depressive episode occurring in middle age. Agitation, rather than a retardation of behavior, is usually evidenced. Moods of hopelessness with deep self-recrimination, paranoid ideas, and thoughts of guilt and worthlessness may be present.

Schizophrenia is the most common form of mental illness. At any given time, about half of the patients in the psychiatric

hospitals of America are labelled schizophrenic. The disease may develop early in life, in early childhood or adolescence, and if treatment is not successful, patients may have to remain the rest of their lives in institutions, some for forty or fifty years. There are great differences between the various manifestations of the disease, but a lack of interest in the real environment and a withdrawal from reality seem to be characteristic of all the forms.

The common forms of schizophrenic psychoses include these types: latent, simple, hebephrenic, catatonic, paranoid, and undifferentiated. Latent schizophrenia is a borderline psychosis; the patient who is suffering from it has not fully broken with reality, but he exhibits queer, eccentric behavior with schizophrenic ideas. His behavior shows mannerisms, seclusiveness, and unpredictability. Adjustment of a sort may be achieved if the patient can maintain his balance through the use of schizophrenic defenses.

In the case of simple schizophrenia, few or no interests and attachments are shown outside the self, so that interpersonal relations are impaired. The patients may not show a loss of mental ability, but a very great loss of interest in anything. If delusions and hallucinations are present, they are often not apparent. This seems to be a quiet withdrawal from situations and ideas which cause anxiety and a return to a lower level of functioning, which does not involve active participation in the surrounding world.

Those schizophrenics who are labelled hebephrenic do not fall into a clear category, but this type seems similar to the simple form except that the patients are more severely disturbed. They show disconnected and fragmentary delusions; hallucinations are

also present. Behavior is shallow and inappropriate with silliness, bizarre ideas, constant talk in a stream of incoherent words, mannerisms, and unpredictable giggling. This is considered severe personality decomposition. The thought processes are fragmented, there is a loss of faith in anything, and a "surrender to disintegration."

The most obvious symptoms of the catatonic form are motility disorders. Patients may move constantly into peculiar postures, make gestures and grimaces, repeat actions over and over for hours at a time, or they may sit in a stupor and not speak or move, even to withdraw a limb if it is extended by force.

The rich development of delusions either of persecution or of grandeur, which are usually changeable, numerous, fantastic, and accompanied by hallucinations, is the most striking feature of the paranoid category. The patients are constantly suspicious and hostile, and have lost contact with reality. Disorganization is severe.

Almost no psychosis fits into a pure category, so a class called "undifferentiated" is added to include those forms of schizophrenia in which any or all of the above patterns may be present but in which none predominate. Recently, this category has come to include those cases formerly classed as latent.

Soon after prefrontal lobotomy first came to be used, it was noticed that the relief of severe pain seemed to be one of its more favorable results. In 1943, Freeman began using the operation specifically for this purpose. Pain is a strong stimulus, which

involves complex relays of sensation, perception, and emotion. Fear and dread become associated with severe pain and the emotional components may come to cause greater anguish than the pain itself; therefore, a reduction in the emotional content should alleviate the suffering. Lobotomy brings relief from suffering, not from pain. It has proven especially effective in cases of terminal cancer; one man reported that he felt fine only a few minutes before he choked to death from cancer of the larynx.[4] Tabes dorsalis, phantom limb, and facial neuralgia have also been treated in this way. Since lobotomy is such a radical operation, a minimal form is usually employed in pain cases. If, however, the operation is not performed far enough in the posterior direction, the suffering is likely to recur.

Few persons feel that lobotomy is an appropriate treatment for the various neurotic reactions. While persons who suffer from such disorders may be in considerable distress, they are not psychotic, and psychotherapy is often sufficient to help them in gaining insight into their problems. Freeman believes that "neuroses are as lasting and as refractory to treatment as many of the major psychoses",[5] so he uses lobotomy in such cases. His aim is not to relieve the problems of the patients, but the emotion and anxiety associated with them.

One of the most controversial applications of lobotomy has been its use upon children. When schizophrenia occurs in childhood, severe pathology in behavior is observed at every level of adjustment. Freeman contends that "it is easier to smash the world of

fantasy, to cut down upon the emotional interest that the child pays to his inner experiences than it is to redirect his behavior into socially acceptable channels."[6] However, most doctors are extremely reticent to use this technique upon a child, for it is necessary to sacrifice a good deal of frontal lobe tissue to get any permanent improvement in the behavior. The younger the child, the more posterior the incisions must be made with consequently more severe damage. Along with what Freeman calls "a new start",[7] such children receive also a new stopping place in their potentiality for normal adjustment.

Time may be an important factor when lobotomy is used to treat the severe psychoses. The longer the disease has persisted, the smaller the chance becomes that lobotomy will be effective in treating it. Many doctors feel that if spontaneous recovery has not occurred within two years after the onset of the illness, it is useless to delay lobotomy further. There will be spontaneous recovery in a few cases after longer periods than this, however, and to deny a patient a chance to recover without the unpleasant personality changes which accompany lobotomy is a step not to be taken lightly.

Lobotomy is in any case a measure of last resort, "the end of the line."[8] It is ostensibly never tried until all other known forms of treatment have failed to help the patient.

CHAPTER FOUR

OPERATIVE TECHNIQUE

There are several types of prefrontal lobotomy. Individual surgeons have worked out different methods of performing the operation. Some, for example, prefer to make the incision on the top of the cranium, or further anteriorially and larger than Freeman and Watts suggest. These procedures afford greater visibility for the surgeon while he operates; Freeman insists that no method is as precise as his own. Regardless of the specific method, the essential features of the operation are the same, so that a detailed description of one such method will suffice to give some idea of the techniques and the problems involved. The following description of the operation is taken from Freeman and Watts' volume, Psychosurgery.[9]

A lobotomy may be classed as minimal, standard, or radical, depending on the plane in which it is performed. The minimal and standard operations are essentially the same except that the minimal does not have the final sweeping cuts into the upper quadrants of the frontal lobes. This technique is used most frequently in cases of intractable pain to lessen the amount of damage to the personality. The radical operation is performed through incisions made in the top of the skull, as far posteriorly as discretion will allow. This method is seldom used until the less drastic types have proven futile. The standard operation is performed most often, and this procedure is described below.

Patients are usually admitted to a general hospital and given

sedatives the night before their operation. They may require special nurses, for many of them are violent and must be forcibly restrained. If they are violent at the time of surgery, they are given morphine to calm them, and a general anesthetic to keep them quiet on the operating table. Many patients suffering from obsessive tension or involutional depression are docile, and these patients may be kept awake during the operation. For them novacaine is used locally in the scalp.

The operating table is tilted slightly (10 to 15 degrees), to keep blood from flowing toward the head. The patient lies with a sandbag under the back of his head; his head has been previously shaved in the operative area, scrubbed, and painted with ether and antiseptics. A rubber dam is put at the edge of the shaven area to keep blood and water out of the hair.

The coronal suture is outlined on the scalp with dye, by measuring a distance of 13 centimeters from the glabella (space between the eyebrows) to the midline of the skull. The lower end of the suture lies at a point 6 centimeters above the zygoma (cheek bone) and 3 centimeters back of the outer edge of the eye. A cross mark is made with dye on both sides; the coronal suture is thus located.

An incision 5 centimeters long is made directly over the lower end of the coronal suture in the plane of the suture (almost straight up and down). The incision is kept open with a retractor, an impression to keep the drill in the right place is made with a chisel,

and a burr hole is bored through the bone. This hole is enlarged with a rongeur (bone cutter), until the opening is 2 centimeters long. This is large enough to allow the surgeon to move the leukotome adequately. An incision is made in the dura mater, and an area in the cerebral cortex which has no blood vessels is selected near the center of the opening. An electrocautery is applied further to reduce the danger of bleeding, and an incision is then made through the deeper membranes. This procedure is carried out on both sides of the patient's head. A cannula is placed through the cortical incision on one side, aimed at the opposite burr hole. The assisting neurologist stands five or six feet back of the patient's head and guides the surgeon as he draws again the line on the scalp directly from the cannula to the midline. This is done in order to allow subsequent cuts to be made with greater accuracy, in an exact line with the actual incisions. The neurologist now holds an applicator stick directly in a line with the cortical incision on one side, and the surgeon pushes the cannula through the cortical incision on the other, pointing it directly toward the applicator stick. The instrument thus goes through both frontal lobes and "usually emerges from the cortical incision in the right frontal lobe, striking the applicator stick." The cannula is graduated, so the exact diameter of the patient's brain can be ascertained. Half of this figure is the distance from the cortex to the middle longitudinal fissure and the anterior cerebral artery, which must be avoided.

The sphenoidal ridge is located next. This is part of a bone

on the bottom of the skull. The point where the cannula would slip off this ridge and over into the middle glossa, which lies posterior to the sphenoid bone, is an important landmark in locating with accuracy the place where the cuts will be made; it is important, because if the operation is performed very far in front of or behind this ridge, a significant difference is seen in the post-operative behavior of the patient.

A precision leucotome, or any other blunt knife, is used to perform the actual operation. The precision leucotome is a formidable looking knife with a graduated blade and a long side arm. The white matter in the upper and lower quadrants of the selected plane is severed while the neurologist keeps careful watch and directs the surgeon to make certain that he keeps the knife in the desired place. The frontothalamic pathways are severed "through an arc of 30 to 40 degrees" with a radius which is calculated to fit the specific operation being performed. These "sweeping cuts" are made on both sides.

The incisions are irrigated with normal saline solution to see if serious bleeding has occurred; this is done until the saline returns looking clear. Stab incisions are made toward the midline and the bottom and upper part of the cortex with a blunt, wide knife known as a radial stab incisor. This type of incision is used because it cuts the white matter without damaging the blood vessels, which are simply pushed aside. If bleeding does occur, it can usually be easily controlled.

Patients are allowed to remain conscious if possible during the

operation because this gives the neurologist a chance to talk with them and thus determine when they become disoriented. Disorientation is an important criterion of success in lobotomy. The following is an excerpt from an actual conversation with a patient during the operation; it gives a concrete notion of the actual procedure:[10]

"Doctor: Are you scared?
Patient: Yeh.
Doctor: What of?
Patient: I don't know, Doctor.
Doctor: What do you want?
Patient: Not a lot, I just want friends. That's all. How long's this going on?
Doctor: Two hours.
Patient: Two hours? I can't last that long. (Squeezes the doctor's hand.)
Doctor: How do you feel?
Patient: I don't feel anything but they're cutting me now.
Doctor: You wanted it?
Patient: Yes, but I didn't think you'd do it awake. O gee whiz, I'm dying! O doctor! Please stop! O God! I'm going again. O! O! O! Ow! (Grabs the doctor's hand and sinks his nails in it.) O God, I'm goin', please stop!

.....
Patient is told to sing "God Bless America". He starts and sings a couple of lines. (Warm saline)
Patient: Ow! That's hot. What's going on here? (The final sweeping incisions are made. Stab incisions started.)
Doctor: Was that hot?
Patient: No, it wasn't hot.
Doctor: How do you feel?
Patient: Yes, yes.
Doctor: Who's operating?
Patient: (Voice suddenly muffled) I dunno.
Doctor: Are you uncomfortable?
Patient: No."

The patient became quite calm after the stab incisions were made in the final quadrant, although it had been almost impossible to control him, even with the help of extra morphine, before.

There is danger that violent jerks by patients may cause more damage than is justified by the advantage of having them awake and articulate during the operation, so that general anesthetics are still widely used.

The operation is always performed on both sides. After it has been completed, iodized oil is placed in the wound so that x-ray pictures may be made. This is done immediately following the operation, before the patient is returned to his room, to verify the plane of section. Gauze bandages held in place with adhesive tape are placed on the incisions, with the hope that the patient will allow them to remain there.

PART II. THE CONSEQUENCES OF THE OPERATION

CHAPTER FIVE

IMMEDIATE CONSEQUENCES FOR THE PATIENT

The aftereffects of prefrontal lobotomy may begin to manifest themselves even before the patient leaves the operating table. He becomes disoriented as soon as the final quadrants are severed in the frontal lobes. He may become violently nauseated during the operation and this condition may continue for several days. When the patient leaves the operating room, he is, in fact, in a rather peculiar condition, described by Freeman as "unlike any immediate post-operative condition with which we are familiar." He seems comfortable and is able to cooperate with the doctors when the x-ray pictures are made. The blood pressure is low and there is sweating, but the patient is not in shock, because his hands and feet are warm and his pulse is slow.

In Freeman's own words:[11]

> "We have therefore, a patient who is not unconscious, not in shock, and not suffering pain as the result of the operation, who can move all his extremities, articulate distinctly and carry out rather complicated commands, and yet this individual is totally unable to tell where he is, what day it is, or who is speaking to him. He has no conception of what has happened to him, and even though he passed through an operation within an hour previously, with all the sensations and rituals connected with it, he may deny that he has been operated upon. When asked about the dressing that covers the wounds, he will pass it off as being of no moment, smile pleasantly and lapse into the former expressionless silence."

For several days, peculiar behavior persists. To all appearances the patients are asleep, but actually they are not, because they can be made to answer if spoken to loudly and persistently enough. They

are uninterested in their surroundings, and appear to be extremely distractible, for often they seem unable to speak if they are at the same time having to look at the doctor and listen to him. By the same token, they may be able to read aloud, but not to converse. They are content just to lie, out of touch with their environment. The passage of time means nothing to them.

Disorientation, as previously mentioned, is such a common consequence of lobotomy that it is used as an indication of the success of the operation. It occurs in all aspects of the patient's life, but is most pronounced in relation to events just past. Relatives are usually recognized first, but it takes much longer for them to orient themselves in time and space. One patient insisted that the Washington Monument must have been moved to Hagerstown, since it was outside her window, and she was in Hagerstown.[12] Others will insist that it is nine o'clock at night even though they have just finished breakfast and the sun is shining outside the window.[13] Patients may be incorrect by a number of years if asked to give the date, and observation has been made that they often give that date at which their psychosis first appeared. Similarly, if asked their age, they often give the age at which their illness first became disabling. Most of them do not remember the period of the operation at all. A complete disorientation toward the self is quite common; patients will deny any connection with deeds of violence which they do while ill, and if confronted with objective proof, they may admit their actions but still insist that they are of no consequence.

In general, patients seem to lose their orientation in regard

to the more complicated spheres of their lives. When familiar, visible, audible, or tangible objects are presented, the patient may recognize them for what they are. Place orientation, however, depends upon the appearance of external symbols, which may not be so familiar, and time orientation depends even more on memory and perception of the relationships between happenings in the environment. A patient may be completely unable to systhesize all these complex functions into meaningful concepts immediately after a lobotomy.

The management of a post-lobotomy patient can pose serious problems to the hospital staff faced with the task, for they may exhibit states all the way from complete stupor to violence. Some are euphoric, overexcited, and restless and carry out repetitive activities, rubbing, stroking, handling and tapping anything available, especially themselves and the bed. Freeman suggests that such patients be given a teddy bear to play with so they will keep their hands off their bandages.[14] More extreme excitement may occur. One man tore up his napkin, picked the plaster above his bed, slapped the nurse on her backside, sang, picked the paint from his chair until his fingernails were worn down, strolled up and down the hall, and finally turned in the fire alarm, to the great consternation of all.[15] Some patients are actually violent and require restraint. Electroshock may help to control the worst cases; it can be used safely within a week after the operation.

On the other hand, inertia may be present to an alarming degree. Some patients lie in bed like wax dummies and never move. They must

be spoon fed and forced to chew and swallow. The "china doll" phenomenon may be seen; the patient lies in bed with his eyes closed and refuses to move. If he is forcibly raised to a sitting position, his eyes come open, only to close again when he is allowed to lie down. Death may occur in the most lethargic cases.

Patients may respond with excessive emotion to happenings about them. Their moods can vary from laughter and jokes to dolorous tears or violent rage. These extreme moods usually do not last long and there seems to be no real depth of feeling contained in them. Such persons, like children, are often managed more easily by diversion than by scolding.

Almost universally, there is no sphincter control just after a lobotomy, so that incontinence becomes a problem. This condition rarely lasts longer than two weeks, although it may persist for the remainder of life. If asked about their failure to use facilities provided, patients show no embarrassment or shame. Even if in later years they have "accidents" which cause them distress at the time, they can laugh and do not seem embarrassed when telling about the incident.

The lowest ebb in post-operative behavior comes about the third day. After that, there is a gradual improvement; by the twentieth day, the worst defects have disappeared and the patient has come back to his preoperative level at least.

CHAPTER SIX

LONG TERM CHANGES ACCOMPANYING LOBOTOMY

Twenty years and countless studies after the first lobotomy performed in modern times, we are in a position to describe at least some of the more permanent results which follow the operation, although underlying causes for changes in the body's functions, the personality and the intellect are not fully understood.

Physiological Changes

Physiological changes following lobotomy may arise from several sources. There is a certain amount of permanent damage to the brain, which is inevitable in any brain operation. Permanent lesions are left by the surgeon's knife and there is, in addition, atrophy in some of the tissues because their blood supply is cut off. The degeneration in the thalamic nuclei has been mentioned previously. Changes in the brain have subtle physiological effects on the body. Further, a reduction of emotional tension by lobotomy will have the effect of bringing the physiological functions which have been overactivated by tension back to their optimal levels of performance.

A change in blood pressure is a common consequence of lobotomy; there may be considerable drop in the systolic pressure. Lobotomy has even been suggested as a treatment for cases of essential hypertension, and some observers believe that it would be possible to use very selective techniques in this connection without causing unpleasant side effects.[16]

There occurs in most cases an increase in gastrointestinal motility. Patients studied by the Columbia Greystone group showed

an increase in emptying time of the stomach, in some cases as great as three hours. A small percentage of the group showed no increase at all, and some actually showed a decrease, thus opposing effects upon gastrointestinal activity are seen.[17]

Bulimia, a disease characterized by excessive hunger, often follows lobotomy and a sizable weight increase may result. Studies fail to pinpoint lobotomy as the cause, however, for lesions in the frontal lobes do not invariably produce abnormal hunger, and it appears further that while lobotomized patients do gain weight, they merely tended to return to their pre-psychotic weight level rather than to grow obese. Further, in this study, the statistics may have been unduly biased by an excessive gain in a few of the patients, rather than a significant gain in all of them.[18] Weight gain may come as the result of increased appetite, and this may be due to the lowering of chronic tension. There does seem to be a problem in many cases, however, of curbing excessive eating. As one patient expressed it:[19]

> "I am hungry right after I eat breakfast and then I get going again, especially sweets. What I like best about the meal is ice cream. If that is before me I never leave it. I would like to get rid of this (200 lbs.) if it weren't so much trouble. Another thing—you doctors must have cut the economy out of my head."

Convulsions are one of the most unpleasant aftereffects of lobotomy. They occurred in 12 per cent of Freeman's cases; the overall incidence seems to be around 15 per cent. They do not invariably follow the ablation of any specific area, which makes

them harder to avoid. They can be quite serious. There are several instances in which patients died in convulsive seizures; one patient suffered one while surf bathing and drowned.[20] They usually develop about one year after the operation, although they may occur immediately. Medication has proven quite effective in controlling them. Their incidence is so high following secondary operations that preventive treatment has become standard in such cases. Interestingly, at least fifty per cent of the patients who develop convulsions after operation had a history of shock treatment before operation.[21]

Increased sexual activity has been mentioned as one result of lobotomy. This increase, if it occurs at all, is likely to be transitory. The trend is rather toward a return to preoperative behavior. Apparently the previous habits of the patient have a much greater effect upon his postoperative sexual behavior than the operation does.

There is unquestionably a risk to life involved in lobotomy. Different mortality rates are given by the various reporters; Freeman finds that operative deaths occur in about 3 per cent of his cases. Most doctors do not feel that the mortality rate is high enough to justify discontinuing the use of the operation. They emphasize the importance of not penetrating too far posteriorally, for this is the worst error that can be made by the surgeon. It not only endangers life but will have definite disabling effects if the patient lives. Undoubtedly, lobotomy contributes to the death of many more people than published results show. As just mentioned, several patients died in convulsive seizures several years after their operation.

If good care is not given immediately following the operation, serious complications can result. There is danger of operative hemorrhage, meningitis, brain abscess, peritonitis, and shock. Pneumonia is another hazard, for mucous may collect in the lungs during the operation. Carelessness on the patient's part may lead to accidents. These distressing things may contribute to the fact that death ultimately resulting from lobotomy may be as high as 20 per cent.[22] Most doctors feel, however, that even in the face of the odds, to deny the operation to a patient is not wise, for in doing so, the patient may be deprived of a chance to be helped.

Changes in Affective Behavior and Personality

In the broadest sense, affective or emotional experiences are those toward which the individual exhibits some kind of feeling, either positive or negative. There is still doubt as to just how such experiences arise. The whole nervous system is involved, especially the autonomic nervous system, the hypothalamus, and the cerebral cortex. About all that can be said with certainty is that emotional experiences are the products of complex psychological and physiological processes.

That the frontal cortex plays an important part in emotional behavior has been clearly demonstrated by the changes which occur in such behavior following lesions in that area. The frontal lobes are connected to the thalamus which also seems to play a very important part in affective experiences and these connections may thus allow affective impulses to be mediated by the cortex and transferred into conscious actions. Herrick calls this "an attractive hypothesis"

which as yet lacks proof.[23] This may offer a partial explanation at least for the changes in affective behavior which follow lobotomy for the interruption of the frontothalamic fibres would disturb this process.

In general, following lobotomy, there seems to be a loss of emotional tension, and of anxiety about the future, a lessening of complaints and a general "leveling of over-all emotional reactions."[24] Findings tend to be somewhat contradictory, however, for while marked changes for the better occur in some cases, none at all are evident in others. "The explanation for either the success or the failure is unknown."[25]

If over-all good effects can be claimed for a case, there does tend to be a decrease in anxiety and complaints as measured by objective tests. This decrease is associated with social improvement and recovery from mental illness. The affective status tends to be more stable, thus allowing the patient to become less painfully preoccupied with his own little world of personal problems and more able to respond favorably to his surroundings.

Similarly, it is hard to find a good comprehensive definition of personality; for purposes of this paper it will be considered as characteristic patterns of adjustive behavior.

There is wide agreement that the personality shows changes following lobotomy, but there is some disagreement about the nature and extent of these changes. In general, there seems to be a lack of depth of feeling, an indifference to criticisms and the feelings of

others, a sense of cheerfulness and complacency, irresponsibility, and a lack of restraint. There is a decrease of self-consciousness, reserve, tact, anxiety, depression, self-blame, sensitivity, and sympathetic attitude toward others. Analyses of Rorschach test data show that patients tend to respond faster, that there is a decrease in responses concerned with anxiety, ambition, conflict, introspection, with characteristic and striking "carefree and unconcerned approach" to the test.[26]

Again, however, there is not complete agreement among findings. Some report that post-lobotomy patients are more cooperative, sociable, and tidy on the wards; nevertheless, long-suffering relatives come with complaints that they are lazy, uninterested, irresponsible, and sloppy at home. The contrast in the two environments must be taken into consideration, however. Many show a childish desire for attention and insistence upon their own way. One writer reports an increase in spontaniety;[26-a] another says this quality shows a decrease.[27]

Freeman and Robinson are in agreement that the most important change which comes about as a result of lobotomy is in "the attitude toward the self."[28] This change is a reduction in the sense of self-continuity. Normal human beings have a sense of themselves as a person who was yesterday, is today, and will be tomorrow essentially the same. They are able to plan ahead and act purposefully as a self. Lobotomy destroys the ability to think in terms of the self in the past as having any relation to the future self or any need and plan for tomorrow. Today alone has meaning. Having set up this hypothesis, Robinson administered the Robinson-Freeman Self-Regarding Span Test

to a number of lobotomy patients and a controlled group. This test was designed to measure the subject's attitudes toward the present, past, and future. Significantly lower scores were made by the operative group.[29]

Porteus and Kepner feel that it would be better, in this connection, to speak of a "self-recognized style of response," and suggest further that "somewhere in the brain there must be a representation of this totality of experience that determines the lines of personality." The intimate relationship between this aspect of the individual and his emotional responses is broken when the connections between the frontal lobes and the thalamus are broken.

Careful psychiatric study of a number of patients who were considered cured by the operation showed that when overt psychotic symptoms disappeared, the patient showed the same basic personality traits he had exhibited pre-operatively but only if complete reintegration of personality took place. The reintegration of a personality is a long, hard task and it requires a large amount of insight into his basic problems on the part of the patient. Psychotherapy is considered to be of value in this connection. Unfortunately, however, if the pre-operative illness was particulary severe, it sometimes does not seem possible to overcome the old, sick patterns; and relapses often occur.

Changes in Intellect

Changes in intellect following lobotomy are quite hard to evaluate for several reasons. The first of these is that there is not yet a complete agreement among psychologists as to just what constitutes

intelligence in the first place, and the evaluation of intelligence suffers accordingly. Despite disagreements, however, some common ground can be found upon which to build a working definition. Most psychologists will, at least, concede that the ability to learn from situations with which the individual comes into contact and to apply this learning in an integrated way to future situations is critical. Also, the ability to abstract is important, because it allows the individual to "think through a problem without spending time and effort on sheer trial and error in action"[31] and to think in terms of the future. A good, comprehensive, capsule definition is that of Stoddard, who states: "Intelligence is the ability to undertake activities that are characterized by difficulty, complexity, economy, adaptiveness to goal, abstractness, social value, and the emergence of originals and to maintain such activities under conditions that demand a concentration of energy and a resistance to emotional forces."[32]

The specific structures that contribute to this behavior have never been isolated. Halstead in his studies of what he calls "biological intelligence" has inferred that this capacity is represented throughout the cerebral cortex, but not equally, rather gradually increasing throughout the anterior portion with the "maximal representation occurring in the frontal lobes."[33] King, on the other hand, concludes that "the frontal lobes do not play a very active role in "measurable intelligence."[34]

Thus, "intelligence" itself is difficult to define and isolate. Another difficulty inherent in the problem of measuring changes in

intelligence after lobotomy is the fact that a psychological test given to a psychotic person may not even begin to give a picture of his real capacity. He is so upset emotionally that nothing close to maximal performance can be expected. After a lobotomy, when low scores are again obtained, it is hard to tell whether the operation or continued emotional difficulty is to blame. The social attitude of the patient may have changed after operation, perhaps for the worse, and this increases the difficulty of comparing test results with those obtained before operation. There is always the practice effect to be taken into consideration as well; for this reason it is desirable to allow considerable time to elapse between the two tests. Despite such difficulties, numerous studies have been done of changes in intellect after lobotomy. The limitations just mentioned contribute to the contradictory results obtained.

Freeman states that "all the differences in accuracy of performance were in the direction of post operative improvement."[35] He found that even on tests of abstract thinking and arithmetical reasoning, both of which are supposed to measure high order of intelligence, pre-operative levels of performance were maintained. Similarly, Robinson found no loss in I. Q. and none in abstract thinking.[36] Porteus Maze studies showed a loss immediately after the operation, but this loss tended to be reversed as time elapsed. The recovery seemed to have a close relationship to the social recovery of the patient. Tests of abstract thinking also showed an initial loss with gradual restitution and no significant difference between operational and control groups.

While the Columbia-Greystone study reported "no permanent alteration

in intellectual function", it did find that certain trends were outstanding. The operated group on the whole failed to show as great a gain on subsequent retests as did the unoperated control group. Whether this was due to a real loss of ability or to a loss of practice effect was not known. There was clear-cut evidence in this study that impairment is closely associated with the area of the brain affected by the operation. The greatest loss on all tests studied occurred if Brodmann's area 8 was affected.[37]

Conversely, many studies do show a definite impairment in intellectual function. Eight of eleven examined by one observer showed a decrease in the I.Q. ranging from -20 points to -3 points. The time elapsing between the operations and the tests varied from three weeks to six months or more. Both the Stanford-Binet and the Wechsler-Bellevue were used.[38]

The most likely explanation for the divergence of these findings is that, in the studies which report no impairment, only psychotic patients were used; in those which do report impairment, psychotic, neurotic, and pain cases were tested. Persons who originally had high scores on intelligence tests tended to show a greater loss than did those who had lower scores to begin with. Thus persons with average or high intelligence who undergo lobotomy can almost always expect demonstrable impairment of intellectual functioning.

Robinson found a loss in performance on tests which required deliberation. She decided that a lack of deliberate behavior was the most outstanding characteristic of post-lobotomy performance. The patients were hasty, "apparently could not slow themselves down."

This study suggests a "capacity for prolonged attention" as a function of the frontal lobes.[39]

Halstead has fault to find with all investigators in this area when he says:

> "unfortunately, the validity of these findings is impossible to assess except perhaps as vital statistics. At no point have other than superficial attempts been made to standardize the criteria for the preoperative and postoperative clinical status of the patients. Not a single patient has been adequately studied. For the social responsibility to do this there has been substituted a phenomenal array of case statistics. The pyramiding of unknowns, however, is scarcely a pathway to knowledge."

Halstead has devised an impairment index, which is intended to measure brain damage in persons who have undergone brain surgery, or at least to measure the probability that such persons have performed as did others with known brain damage. The probability scores ranged from zero to 1.0. No person with frontal lobectomy received a score below 0.5 on the test, but people with lobotomies often yielded scores which were significantly lower. Thus, in contrast to lobectomies, lobotomies do not appear to greatly alter biological intelligence.[40] Halstead is careful not to read too much into these results, however, and he emphasizes that the reason they came out as they did may have been inherent in the impairment index.

CHAPTER SEVEN

SOCIAL AND OCCUPATIONAL ADJUSTMENT FOLLOWING LOBOTOMY

The performance of a prefrontal lobotomy has far-reaching effects upon the lives of many persons other than the patient. Real difficulties begin to emerge when the patient is allowed to leave the hospital and return home.

Social adjustment following lobotomy is the greatest problem faced by the patient and by his family. At first, he is virtually a child, and his irresponsibility and lack of depth of feeling make him almost impossible to live with. The type of family the patient has is one of the most important factors to be taken into account when the operation is being considered, because if he does not receive constant care and encouragement, his chances of post-operative improvement will be greatly reduced. Many families make a complete adjustment to the absence of the patient and do not wish to have their home disrupted by the intrusion of a person who is, at best, something of a problem and, at the worst, requires almost constant care. Then, from the patient's standpoint, he may be better cared for in an institution. Studies are being made to determine the optimal environment for such patients, but at the present time, the final choice is up to the family. If they want the patient badly, he is released to them.

When he first leaves the hospital, the post-lobotomy patient must go through an extensive program of reeducation, as though he were growing up again. He must be treated like a child at first, and urged or forced to get up, dress, and help around the house.

Often patients will spend two or three hours in the bathroom and have to be bathed in the bargain if they are to be kept clean. Diapers become another problem. Impulsiveness and a lack of restraint create a hazard, for if a patient wants to fight, he fights with anyone who is handy, and some of the patients are six feet tall. Freeman recommends force of any sort to elicit cooperation. This can mean a battle all day long. One mother began the morning by turning the mattress over on her daughter to impress upon her that it was time to get up.[41] Often there is a battle to get patients to come to meals and then another one to make them stop eating. If the family can live through this stage, the patient may begin to show a gradual improvement, as though he were a child growing up all over again. He may regain enough of his former status to help with the housework, and, if he is successful, in time he may be able to find work outside the home.

In general, it seems that if the patient has guardians who are strong and active and who are extremely anxious to help him in every way they can, he may have a chance to work through this most difficult period. The worst behavior usually lasts from six weeks to six months; it may go on for as much as two or three years. Improvement is always possible, but the cost in family peace may be high.

On the other hand, if there are children in the patient's family, the situation is somewhat different, especially if the patient is one of the parents. Numerous cases are cited of patients who go home "arrogant, irritable, irresponsible, and self-indulgent."[42] The anxious defenses against undesirable behavior may have been removed

and nothing put in their place. The spouse resents such behavior, and the children may come to fear their parent. There are several instances in which the children faced with this situation had finally to be placed in corrective institutions. It would seem better for such families if the patient remained in the hospital, although he might have been made more comfortable at home.

The family and the community must be fully aware that the patient will return to them at a "lowered emotional and personality level, and with a diminished concern as to consequences."[43] It requires patience and understanding to accept such a person. Social workers often try to aid in this process of adjustment with extensive follow-up programs. Their efforts have led them to question seriously whether or not lobotomy patients can be helped by post-operative social service. One worker pointed out that "psychosurgery had done something to the individual which makes him relatively unable to profit from the special aids which the social service discipline had to to offer."[44] Further, the families of such patients often do not respond favorably to such help. It was pointed out that such families may often be "society's failures" anyway, so that working with them is doubly hard. It was the unhappy conclusion of one study that "supportive family situations are just not to be found."[45]

The results of lobotomy must not be evaluated solely with respect to the patient's subsequent adjustment outside the hospital, for at least a fourth of them remain in institutions. Although they are not well enough to go home, they may have become much less difficult to management inside the hospital. It is hard to assess the degree of improvement shown by a psychotic patient if his psychotic

symptoms persist, but if he has become less agitated, he is probably more comfortable at least. He can be considered improved from the management's point of view. One study found that of a large number of patients submitted to lobotomy seven-tenths of them were improved enough to require less management, while only three-tenths required as much care as they had before.[46]

The objective of lobotomy is the relief of psychotic symptoms which have made the life of an individual unendurable to him and to his family. As Freeman expressed it, anything beyond that is "pure gravy".[47] To leave the hospital is a moderate achievement; to hold down a job is an even better one.

Many patients who could not do so before are able to work in the hospital after lobotomy. For these persons, one observer reported a great increase in spontaniety, more activity, more organized and continual application to tasks, and a great increase in neutral affect. Some were considerably more friendly and sociable than they had been before. A five year follow-up study found that a significant number of patients were able to adjust to work better after the operation than they had been before. Only two per cent had been considered good at their jobs before, while twenty-five per cent were considered good afterwards. The number considered poor at work had decreased from eighty-one per cent to twenty-five per cent. The jobs held after the operation were less skilled than those held previous to it; nevertheless, the improvement in the patients above the preoperative standing was described as "striking and sustained."[48]

It is thought advisable for the patients to work as soon as they

can find a suitable job and are capable of staying on it. They like to feel financially independent in as far as they can. Many of them encounter difficulties, however. Their decreased ability to concentrate upon one thing makes them irresponsible, and they may wander off in mid-task without the least concern. It is usually necessary for them to have close and direct supervision. Work under persons who understand the situation and will prod them to keep them busy is often the only solution.

Some women have been able to go home and keep house, but others find that the complexities of caring for a home and a husband are too much for them and they require help. Patients are apt to have little conception of the value of money and either spend it without concern or will not spend it at all.

Very few persons who have had lobotomy are able to work at the professional level. One young lawyer was able to work as a government clerk.[49] One very interesting case is that of a teacher who made an "excellent adjustment"; "there is something about her alert and vivacious personality that makes it possible for her to get along with children exceptionally well, though she is regarded somewhat askance by her employers and her fellow teachers. They have to admit, however, that she is an inspiration to the children under her charge."[50] There were no cases of doctors, dentists, or nurses who were able to practice successfully after lobotomy. There was one inventor, who, eleven months after his operation, patented a complicated elliptical wheel dressing machine, but he later suffered a relapse and had to return to the hospital.[51]

Some hospitals have extensive follow-up programs and try, with the aid of vocational guidance workers, to find jobs for their patients. Some employers are willing to cooperate with them and give special consideration to such persons. An occupation has been found to be a "definite stabilizing factor"[52] in the life of the patient who is able to hold down a job. The picture is not a very encouraging one, however. In many cases, even if patients can work satisfactorily at first, they become less and less able to concentrate and finally wander the streets aimlessly or return to hospitals.

Social and occupational adjustment have been widely used to evaluate the results of lobotomy. At any rate, they lead now to a consideration of studies of overall "improvement" following the operation.

In a report covering two hundred fifty-four lobotomized patients, it was found that three months after the operation, 53 per cent had improved significantly. One year later, 60 per cent had shown significant improvement; the same number were considered improved at the end of two years. A patient was considered improved if he had become less of a management problem, or better, if he had gone home from the hospital.

One hundred control patients were carefully matched with those who had the operation. Better than 75 per cent of both groups had been in the hospital two or more years prior to the study. Both groups underwent the same surgical procedure, except for the cutting of the frontothalamic connections, and received the same kind of post-operative care. The controls showed some improvement which may have been due to the extra care and nursing they got during the experiment.

At the end of the entire two-year period, in a breakdown, 9 per cent of the lobotomy patients had recovered, as compared with 0 per cent of the controls. 18 per cent of the lobotomy patients and 0 per cent of the controls had shown marked improvement; 30 per cent of the controls were considered slightly improved; 13 per cent of the lobotomy patients and 92 per cent of the controls were unimproved; and 4 per cent of the lobotomy patients and 2 per cent of the control patients were dead.

At the beginning of the study, all of the patients had been marked management problems. They fought the attendants, and were irresponsibly destructive. Only 2 per cent of them were allowed on open wards, while 41 per cent were on closed wards and 54 per cent were on disturbed wards. Two years later, of the patients who had lobotomy, 37 per cent were at home, 9 per cent were on open wards, 43 per cent were on closed wards and only 6 per cent were still on disturbed wards.[53] These figures are impressive. The real trouble, however, lies in the difficulty in measuring the improvement in a psychotic person and the trials the patient's family may be going through.

Freeman reports the results of studies made of six hundred seventeen patients.[54] Of this number, 45 per cent were considered to have shown good results following the operation. This meant that they had returned home and were able to hold down some type of job. Fair results, which meant the patient had returned home but was unable to work or to adjust completely at home, were shown in 33 per cent of the cases. Poor results, meaning no improvement and continued hospitalization, were seen in 19 per cent of the patients.

Three per cent died as the direct result of the operation. Taking all results together, he says that

> "it would appear that good results are obtained in about one-third of the cases, fair results in another third, while the other final third do not respond to the treatment. The overall death rate runs around 3 per cent and approximately 1 per cent of the patients are made worse by operation. This would appear to be a rather satisfactory record in itself, since practically all investigators have undertaken lobotomy only in hopeless cases of mental disease."[55]

The problem remains one of determining just which mental patient is an improved mental patient. Many attempts have been made to measure quantitatively and objectively the amount of or lack of improvement shown by psychotic patients at any given time. It is hard to tell if a quiet, depressed mental patient, who continues to seem quiet and depressed after an operation but is no longer worried about it, is really improved or not. There are no conclusive results from studies along this line yet.

SUMMARY AND CONCLUSIONS

It might be well to state once more the question originally asked in this paper: What is the nature and what are the consequences of prefrontal lobotomy?

Lobotomy was a daring innovation not many years ago, a radical, last-resort measure which showed a remarkable first success. It was a "blind" operation then, and still is, for the surgeon neither sees nor knows exactly what he is cutting in an enormously complex organ; he knows only that he is severing fronto-thalamic connections and that this operation has been beneficial to some psychotics. The operation is selective in that its success with affective psychoses is much more marked than with schizophrenia, although it is used most often in cases of the latter type. The more deteriorated a patient is, the smaller chance he has to recover so that an early operation seems indicated. Spontaneous recovery has great advantages over any other kind, however, and should be given every chance to occur.

The results of lobotomy are easy to see, hard to appraise. Immediately following the operation, the patient is disoriented, apathetic, and incontinent, and does not appear to be anxious about anything. There follows a period of confused, child-like behavior, during which the utmost care and understanding are required to help him regain a maximal level of performance. Patients may be aware of their former problems or painful experiences, but they no longer worry about them. Even if they become well enough to support themselves, they show a happy-go-lucky divorcement from any responsibility for their own actions. Personality changes are final. Non-psychotics, who were formerly classified as having normal or better intelligence,

show an impairment of performance on intelligence tests, although psychotics whose scores were always low fall no lower on the scale. Lobotomy has been successfully used in the treatment of intractable pain when a good deal of anxiety and fear was connected with the suffering.

Social adjustment may be difficult. Particularly where children are concerned, lobotomized patients can have decidedly bad effects upon other members of the family if they live at home. The nature of the family to which the patient is to return is of the utmost importance in selecting those persons who are to undergo lobotomy. Many persons are able to hold a job after lobotomy, although most of the jobs are at a lower level than those held prior to the operation.

It is of vital importance to keep two things in mind when the use of any form of treatment for disease is questioned. First, a sick or psychotic individual is suffering and often to a degree which he finds unbearable. Second, he may try to harm himself or other persons; he can neither accept himself nor can society accept him. He can be removed from society and placed in an institution, but there is no removing him from himself. Various methods of treatment may be used. If all fail to help, there remains only surgery to try.

Lobotomy is immutable; once done, it can in no way be undone. The patient has roughly one chance in three to improve enough to live in peace outside the hospital. If he is unable to leave the hospital, his tension and worry may still be greatly alleviated.

There is a slight chance that he will become worse or die. He will certainly, no matter how great his improvement or lack of it, emerge from lobotomy a changed person who can no longer function at as high a level as was formerly possible for him. He will no longer be the sensitive, feeling human being he was before the onset of his psychosis, but he will not know the difference.

Less radical methods of psychosurgery, notably transorbital lobotomy and the various methods of cortical undercutting or ablation, have shown promise of having the good effects of prefrontal lobotomy without, to as marked a degree at least, the unpleasant after effects. In several hospitals, prefrontal lobotomy is no longer used until one or another of the other methods has been tried once or twice without success. There is a trend away from prefrontal lobotomy, especially in those cases who were not psychotic to begin with. When more knowledge of the functions of the specific areas of the frontal lobes and the thalamus is gained, it may be possible to devise new methods which can eliminate the undesirable effects altogether. This is the goal of conscientious scientists; until it is reached, however, lobotomy will probably keep its place as a measure of last resort.

The real and most basic problem concerning mental illness is: How, where and why does it develop? Until the fundamental causes which underlie psychosis have been found, any technique for its treatment must remain a sort of predictable shot in the dark.

APPENDIX

The Case of Doris B.

The following case has been selected as illustrative. It seems to strike a sort of middle ground between the best and the worst of the many studied. This patient was able to adjust with some degree of satisfaction outside of the hospital and was fortunate enough to find work with an understanding employer so that she could support herself. It is from studies such as this that the most vivid picture of post-lobotomy personalities is seen.[56]

> Doris B. was thirty-eight years old when lobotomy was performed on her and at that time had been mentally sick more than half her life. Even as a child she was cruel, turning over baby carriages with her small siblings inside, dumping out groceries in the floor of her father's store and making a royal mess with them. She was never affectionate toward her parents and snubbed other children of her own age. She would not allow her sisters to come into her room or touch anything which belonged to her.
>
> When she was nineteen years old she became excited after a sinus operation and cried, danced about and begged her parents to forgive her for having been so bad all her life. She explained this behavior on the grounds that she had pus in her head. Psychoanalysis at this time brought out some sexual fantasies but failed to help for she developed hallucinations and was unable to keep any position. She would not do anything at home and quarrelled with everyone. For a year and a half she was kept in an institution, but was discharged as unimproved. After a year, she entered another hospital where she made life difficult for all by banging on the piano, throwing herself on the floor, striking people and threatening to drown herself in the reservoir. She was negativistic and argumentative, blamed all her own misbehavior on the other patients. She denied hallucinations but spent much of her time in a dialogue with herself, using a deep voice for one side of the talk and a high squeak for the other. She ran around the ward nude at night, blaming this on the nurses because they asked her to be quiet.
>
> She had insulin shock treatment for three months and was so improved that she went home but came back to the

hospital soon because she was unmanageable. She explained that her sister was really the psychotic one and kept her confined out of malice. She had many brief periods of parole, but was never able to remain at home.

At the time of operation, she was described as a "fat, sloppy, hairy woman, approaching middle age . . . with a rather over-alert expression." After the operation she was inert, with vomiting and incontinence, but her anxiety and apprehension were much lessened. She became friendly as the inertia wore off.

Various stages of childish behavior followed the operation. But for the kind and unselfish devotion of her mother, it is doubtful that she would have been able to leave the hospital. Her mother made a game of toilet training and bathing, and gave her little tasks about the house. In order to make her wash dishes, the mother would hold her penned at the sink by force. At first, Doris was docile, but became more stubborn and it became a real problem to get any cooperation from her. She was preoccupied with fantasies but did not seem to be troubled by them.

Her mother did all within her power to follow the doctor's suggestions and to help her unloving daughter regain her health. Doris gradually showed improvement. She stopped singing and talking to herself and her surly and petulant behavior came under control. The mother continued to help patiently with Doris' dressing, feeding her as a reward for accomplishments but trying at the same time to help her to lose weight. The family felt that the strain was too much and wrote the doctor about putting Doris back into the hospital. This is his reply in part:

> "Your mother has my sympathy and, if she can't stand it, she can always take Doris back to the institution . . . I would be sorry to see that, since patients who get back into the institution return to their previous slovenly habits, whereas Doris has by no means had sufficient time to convalesce and certainly has not reached her maximum level of performance . . . . Actually Doris is just as much disabled, if not more so, than she was before her operation, and is deserving of the combined efforts of the whole family in getting her rehabilitated. This may require more than persuasion and argument on the part of you and your mother, because Doris is impervious to these. Some families have gotten pretty good results with a switch."

Shortly after this Doris' mother committed suicide. This unfortunate occurrence may have been due to the great strain imposed upon her by the care of her daughter from which she got no apparent return, either in improvement or appreciation on Doris' part. At any rate, this event had a sobering effect upon Doris and she became much more co-operative and even began to work part-time for a kind rabbi who gave her much understanding and encouragement. He wrote the doctor, and Doris typed the letter, (indicative of the kind of thing which a post-lobotomy patient can take with no apparent feeling of any sort).

> "It may interest you to know that Doris B. has been working for me on the average of two hours a day for more than a month. I can see quite an improvement in her work in the past month. In the beginning she would frequently go into day-dreaming and I would have to call to her: 'Doris, get on with your typing.' In the last two weeks I never had to hurry her in her work. Her typing, too, has improved. Her shorthand is still poor, but it seems that it will take a little time for her to master the correct reading of her own shorthand. Her delivery of messages over the telephone is satisfactory. . . I feel that I am giving Doris a chance to gain complete improvement and confidence in her work as a stenographer."

Eventually, Doris was able to hold down a full-time job with a business firm. She handled her money well, had no convulsions or incontinence. She was rather careless in her dress and used too much makeup, but was described as "quite reserved and dignified in the presence of strangers." A photograph taken of her almost a year after the operation shows a fat woman with rather unkempt hair and a silly, simpering expression.

FOOTNOTES

1. This history was taken from material found in:

   Walter Freeman and James Watts. Psychosurgery.

   John F. Fulton. Frontal Lobotomy and Affective Behavior.

2. This section was compiled from material found in the following sources:

   Ward C. Halstead. Brain and Intelligence.

   C. Judson Herrick. Brains of Rats and Men.

   Walter Freeman and James Watts. Psychosurgery.

   John F. Fulton, Frontal Lobotomy and Affective Behavior.

   T. B. Johnston, ed., Gray's Anatomy.

   F. H. Netter. The Ciba Collection of Medical Illustrations. Volume I, The Nervous System.

   Clifford Morgan and Eliot Stellar. Physiological Psychology. McGraw-Hill Book Company, New York, 1950.

3. The descriptions of the psychoses are taken from:

   J. C. Coleman. Abnormal Psychology and Modern Life.

   Robert White. The Abnormal Personality.

4. Bonner, et. al. "Frontal Lobe Surgery for the Relief of Pain," Psychosomatic Medicine. Vol. 34.

5. Freeman and Watts. Psychosurgery. p. 456.

6. Walter Freeman and James Watts. "Prefrontal Lobotomy in Children, Eleven Cases", Digest of Neurology and Psychiatry, Institute of Living, p. 220.

7. Freeman and Watts. Psychosurgery. p. 440.

8. Ibid., p. 203.

9. Ibid., p. 31-65.

10. Ibid., p. 125-126.

11. Ibid., p. 137.

12. Ibid., p. 139.

13. Ibid., p. 141.

14. Ibid., p. 147.

15. Ibid., p. 156.

16. Fulton. op. cit., p. 114.

17. Fred A. Mettler. ed. Selective Partial Ablation of the Frontal Cortex.

18. Buck, et. al. "Transorbital Lobotomy in Chronically Disturbed Patients," American Journal of Psychiatry. Vol. 108.

19. Freeman and Watts. Psychosurgery. p. 92.

20. Ibid., p. 105.

21. Ibid., p. 104.

22. Mettler, op. cit., p. 3.

23. Herrick, op. cit., p. 232.

24. Freeman and Watts. Psychosurgery. p. 237.

25. Mettler, op. cit., p. 432.

26. Van Walters, et. al., "Rorshach Evaluation of the Schizophrenic Process Following a Prefrontal Lobotomy," Journal of Psychology. Vol. 25.

26a. Scoville, et. al., "Selective Cortical Undercutting," Journal of Psychiatry. Vol. 167.

27. Klebanoff, et. al., "Psychological Consequences of Brain Lesions and Ablations," Psychological Bulletin. Vol. 51, p. 28.

28. Freeman and Watts. Psychosurgery. p. 316.

29. Ibid. p. 319-328.

30. Porteus and Kepner. "Mental Changes After Bilateral Prefrontal Lobotomy," Genetic Psychology Monographs. Vol. 29, p. 12-13.

31. Frank S. Freeman. Theory and Practice of Psychological Testing.

32. Ibid., p. 72.

33. Halstead. op. cit., p. 149.

34. Mettler. op. cit., p. 204.

35. Freeman and Watts. Psychosurgery. p. 306.

36. Ibid., p. 311.

37. Mettler. op. cit., p. 178-207.

38. Klebanoff. op. cit., p. 21-25.

39. Freeman and Watts. Psychosurgery, p. 311.

40. Halstead. op. cit., p. 127.

41. Freeman and Watts. Psychosurgery. p. 187.

42. Aldrich. "Problems of Social Adjustment Following Lobotomy", American Journal of Psychiatry. Vol. 107.

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45. Ibid., p. 39.

46. Wilson, et. al. "Transorbital Lobotomy in Chronically Disturbed Patients," American Journal of Psychiatry. Vol. 108.

47. Freeman and Watts. Psychosurgery. p. 203.

48. Greenblatt, et. al. "Survey of Nine years of Lobotomy Investigations," Journal of Psychiatry. Vol. 109.

49. Freeman and Watts. Psychosurgery. pp. 220-224.

50. Ibid.

51. Ibid., p. 463-472.

52. Overholser. op. cit., p. 40.

53. Friedman, et. al. "A Progress Study of Lobotomized and Control Patients," American Journal of Psychiatry. Vol. 108.

54. Freeman and Watts. Psychosurgery. p. 500.

55. Ibid., pp. 487-513.

56. Ibid., pp. 439-440.

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